

REPLY TO FINAL OFFICE ACTION OF 25 MARCH 2008

Docket: 113067.00022

Serial Number: 10/625,792

Filing Date: 23 July 2003

Title: OPTICAL DISPLACEMENT SENSOR FOR INFUSION DEVICES

Assignee: DEKA Research & Development Corp.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the subject application.

Listing of Claims:

1. (Currently Amended) A displacement sensor for a medical fluid pump ~~a substance dispensing device~~ having a reservoir and a translating piston, the sensor comprising:
 - a. a plunger rod coupled to the piston bearing an encoded pattern of encoding features, wherein the encoding features includes a plurality of slots, the spacing of the encoding features from one another defining spaces between such that any two adjacent spaces form a unique sequence;
 - b. a light source for illuminating the encoded pattern;
 - c. a detector array for detecting light from the illuminated encoded pattern and generating a detector signal, said detector array configured to detect at least two of said plurality of slots simultaneously; and
 - d. a processor for determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal, ~~wherein the encoding features further uniquely identify a characteristic of the reservoir other than the displacement of the plunger rod~~.
2. (Original) A displacement sensor according to claim 1, wherein the encoding features are regions of modulated optical transmission through the plunger rod.
3. (Original) A displacement sensor according to claim 1, wherein the encoding features are regions of modulated optical reflection by the plunger rod.
4. (Original) A displacement sensor according to claim 1, wherein the encoding features are a plurality of slots of enhanced transmission through the plunger rod.

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5. (Original) A displacement sensor according to claim 4, wherein each slot is displaced from each pair of nearest neighbors by a unique combination of distances.

6. (Previously Presented) A displacement sensor according to claim 4, wherein the combination of any two adjacent spaces between slots uniquely identifies the characteristic of the reservoir.

7. (Cancelled)

8. (Previously Presented) A displacement sensor according to claim 6, wherein the characteristic of the reservoir is a content of the reservoir to which the plunger rod pertains.

9. (Previously Presented) A displacement sensor according to claim 6, wherein the characteristic of the reservoir includes at least one of a diameter and a wall composition material.

10. (Original) A displacement sensor according to claim 1, wherein the light source includes an optical diffuser for illuminating a region of the plunger rod with substantially uniform optical intensity.

11. (Original) A displacement sensor according to claim 1, wherein the encoded pattern of encoding features repeats along the plunger rod.

12. (Currently Amended) A medical fluid dispensing apparatus comprising:

- a. a reservoir having a cylindrical inner volume for containing a medical fluid substance;
- b. a plunger rod for impelling a piston along a linear axis of motion within the inner volume of the reservoir in order to displace and dispense a measured quantity of medical fluid substance;

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- c. an encoding pattern of encoding features disposed along the plunger rod in a direction substantially orthogonal parallel to the linear axis of motion of the piston, wherein the encoding features includes a plurality of slots, the spacing of the encoding features from one another defining spaces between such that any two adjacent spaces form a unique sequence;
 - d. an illumination source for illuminating the encoded pattern;
 - e. a detector array for detecting light from the illuminated encoded pattern and generating a detector signal, said detector array configured to detect at least two of said plurality of slots simultaneously; and
 - f. a processor for determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal, ~~wherein the encoding features further uniquely identify a characteristic of the reservoir other than the displacement of the plunger rod.~~
13. (Previously Presented) A dispensing apparatus according to claim 12, wherein the encoding features are regions of modulated optical transmission through the plunger rod.
14. (Original) A dispensing apparatus according to claim 12, wherein the encoding features are a plurality of slots of enhanced transmission through the plunger rod.
15. (Original) A dispensing apparatus according to claim 14, wherein each slot is displaced from the pair of nearest neighbors by a unique combination of distances.
16. (Previously Presented) A dispensing apparatus according to claim 12, having more than one reservoir version, wherein the encoding pattern is uniquely determinative of a version of the reservoir.

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17. (Currently Amended) A method for measuring a rate of dispensing a medical fluid substance by means of a medical fluid pump—dispenser having a piston driven along an axis of motion within a reservoir of the medical fluid substance, the method comprising:

- a. illuminating with an illumination source an encoded pattern of encoding features disposed upon a plunger rod coupled to the piston, wherein the encoding features includes a plurality of slots, the spacing of the encoding features from one another defining spaces between such that any two adjacent spaces form a unique sequence;
- b. detecting light from the illuminated encoding features and generating a detector signal via a detector array configured to detect at least two of said plurality of slots simultaneously; and
- c. determining a displacement of the plunger rod relative to a fiducial reference position based at least on the detector signal, wherein the encoding features further uniquely identify a characteristic of the reservoir other than the displacement of the plunger rod.

18. (Original) A method according to claim 17, wherein the step of detecting light further includes acquiring an image of the illuminated encoding features.

19. (Original) A method according to claim 17, wherein the step of determining a displacement further includes determining positions of peaks of light transmission through the encoding features.

20. (Previously Presented) A method according to claim 17, further including the step of storing each successive detector array value in each of successive groups of software array elements.